

# Rapid Floodplain Modeling

## Implementing the Results of the Statewide Iowa Floodplain Modeling Project

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Hydraulics Engineer

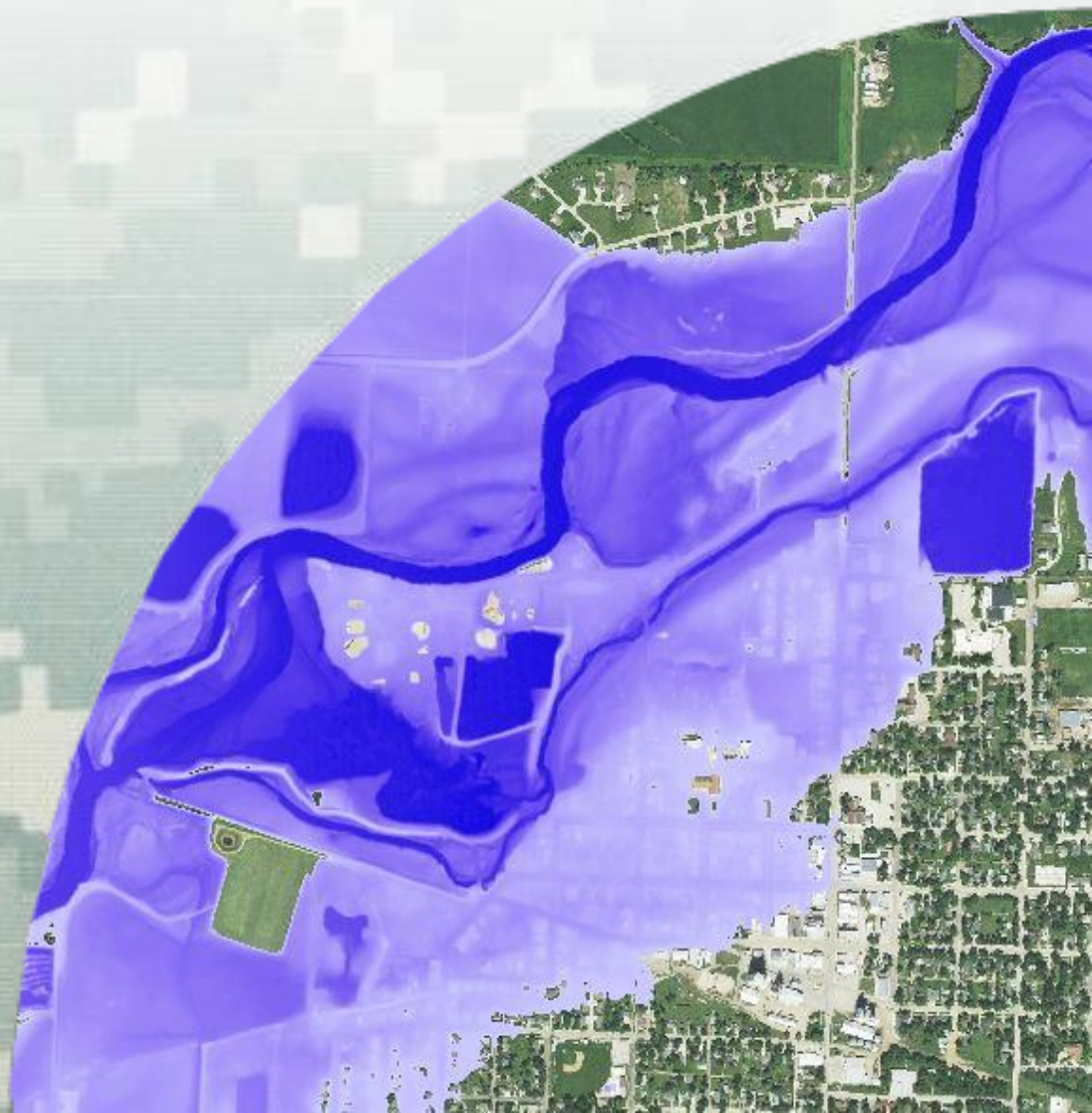
USACE - Omaha District

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08 March 2018



US Army Corps of Engineers  
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## Rapid Floodplain Mapping



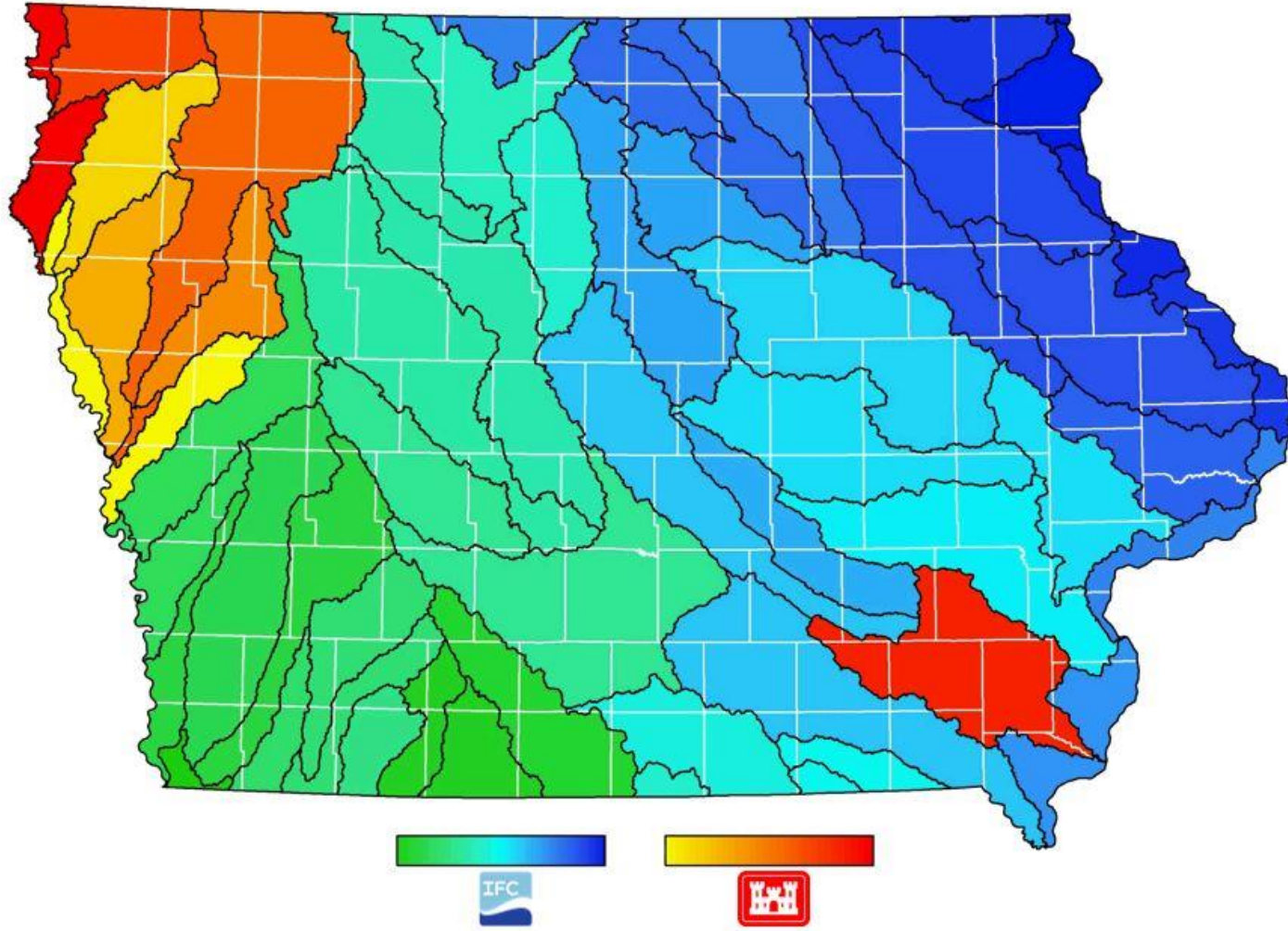
# A Need for New/Updated Mapping

- The Omaha District/IFC developed automated scripts that:
  - Sets up the HEC-RAS (Hydraulic Model) data
  - Manages the data (such as the flow and geometry data)
  - QA/QC tool – 100% manual review is not needed
- Iowa Floodplain Mapping Project
  - USACE Section 22 for 8 HUC8 Watersheds
  - 55 HUC8 Watersheds total
  - Goal was to develop data applicable for a Zone A approximate study to be incorporated into the NFIP
- Through the application of statewide LiDAR data and GIS automation tools, HEC-RAS models are used to develop this data.
- Automated methods have been developed to assist hydraulic modelers in verifying that engineering products meet specific requirements.



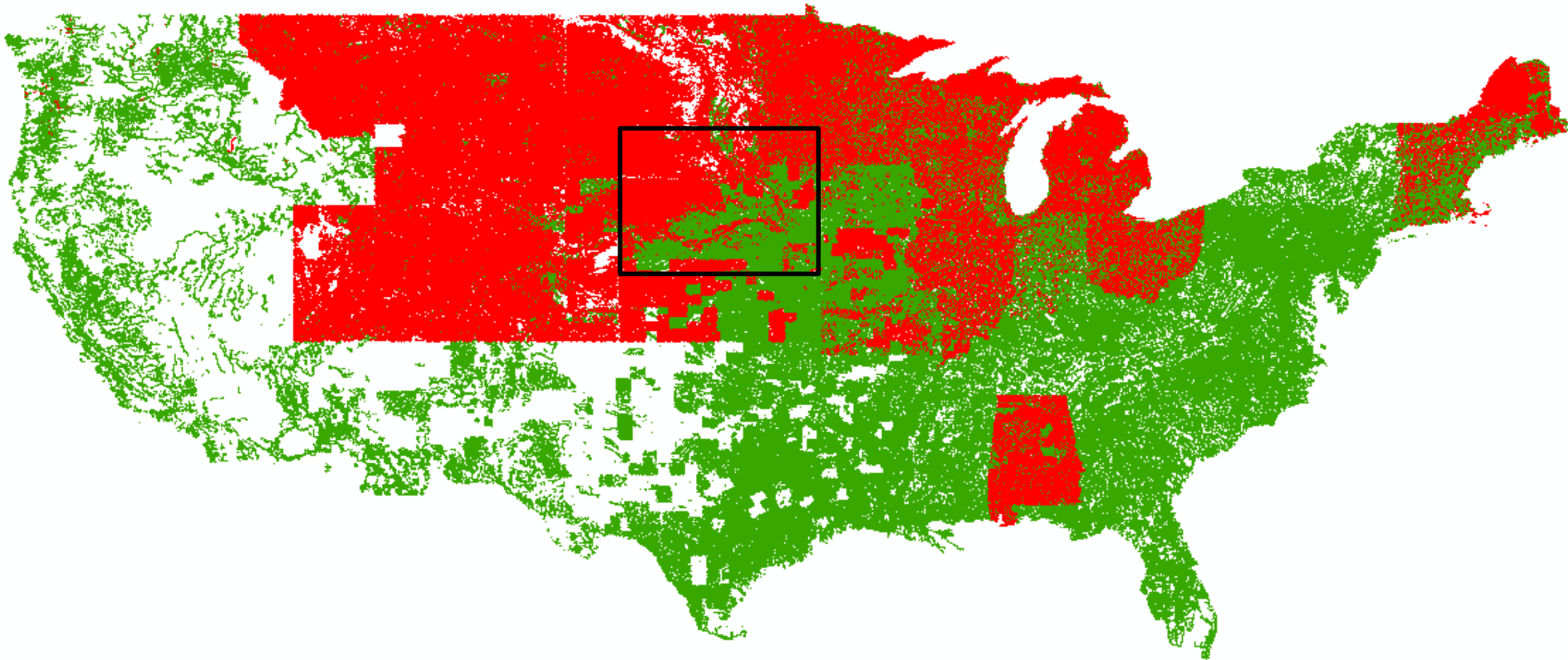


# Study Area



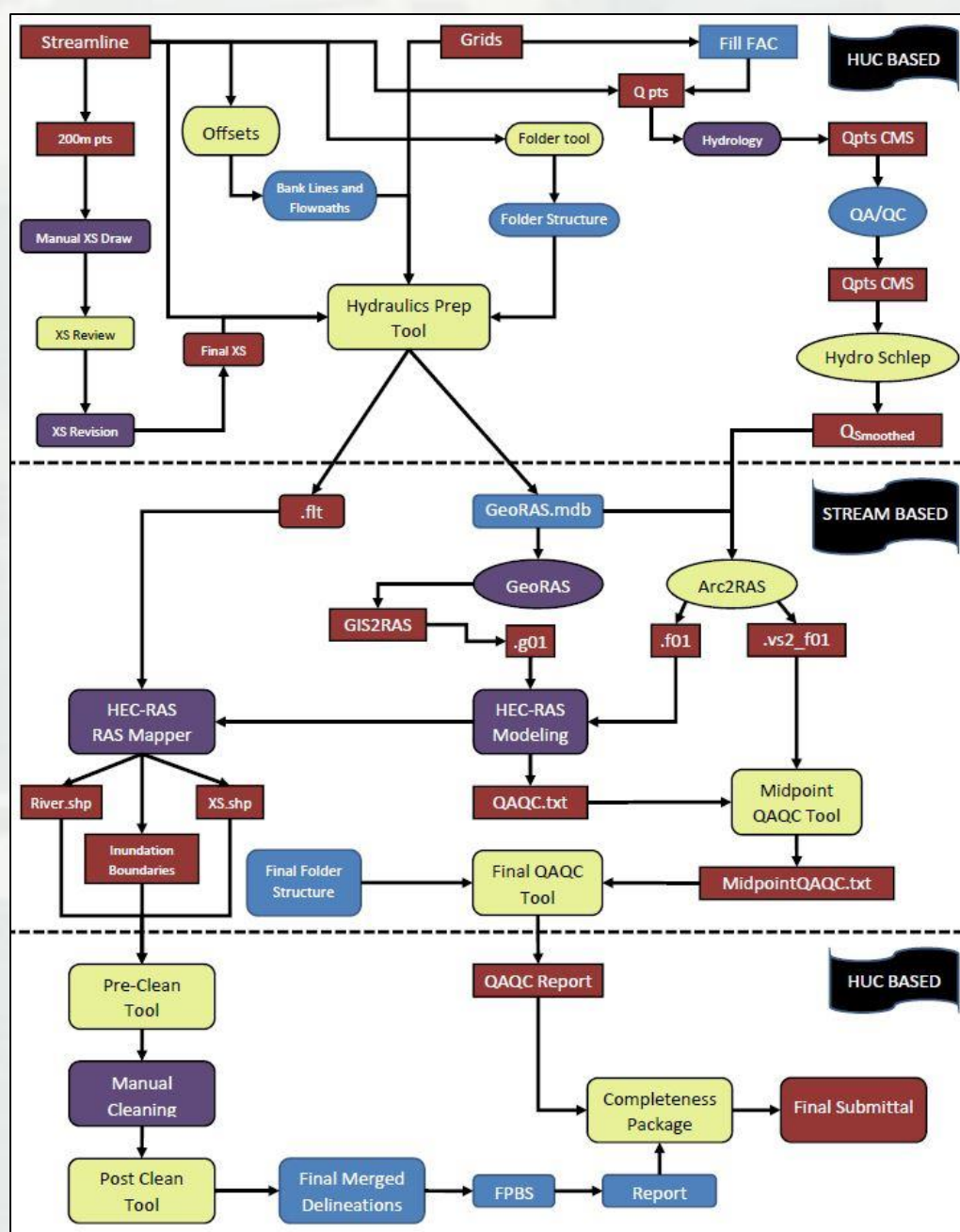
# Coordinated Needs Management System (CNMS)

A FEMA initiative to update the way FEMA organizes, stores, and analyzes flood hazard mapping information for communities.



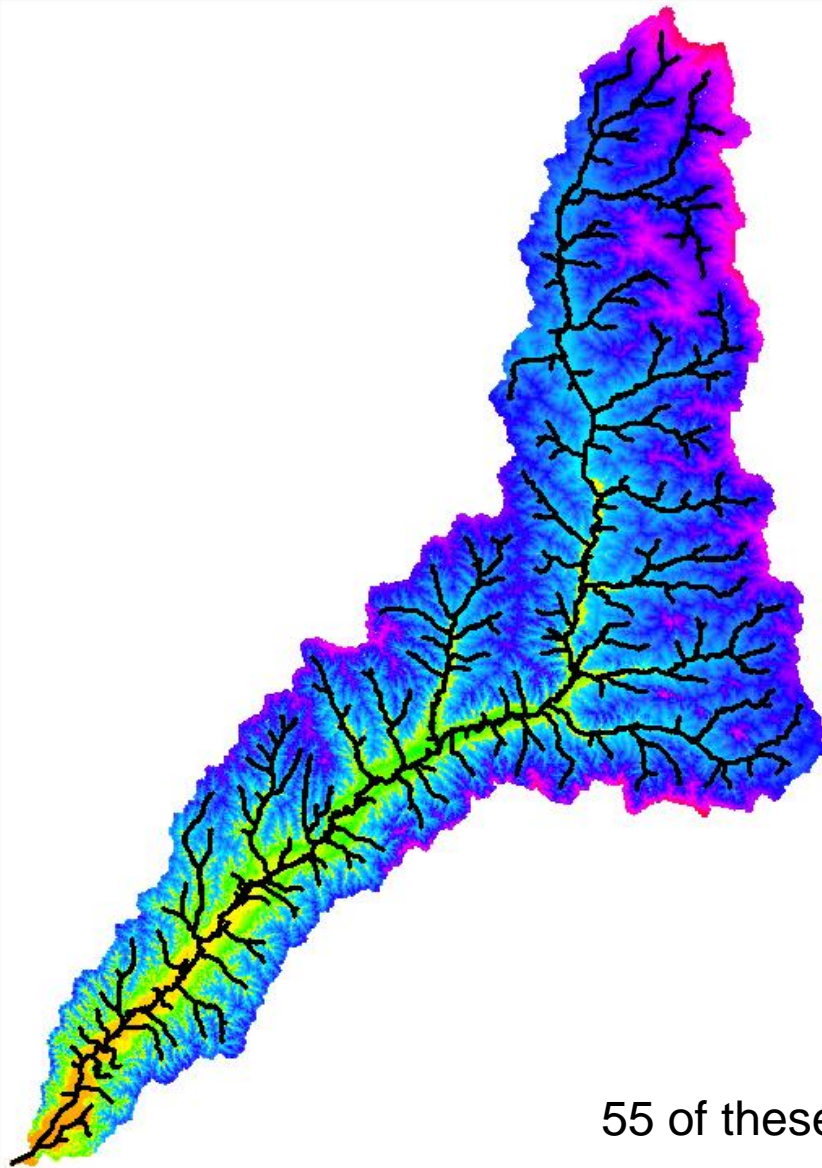
- Studied Stream Lines
- Unmapped Stream Lines



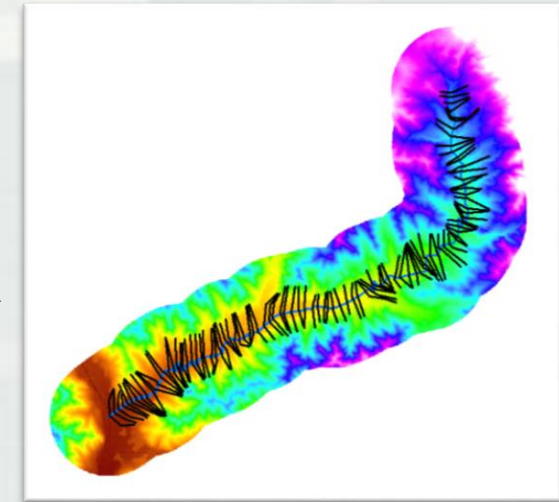




# Large Data Set – Entire Watershed/HUC



55 of these



13,000 of these  
100,000+ stream miles



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# Hydraulics Prep Tool (Python Scripts)

# Hydraulics

# La\_Crosse\_River\_orig.mxd

Model\_Polygon.dbf

# Model\_Polygon.prj

Model\_Polygon.sbn

Model\_Polygon.sbx

Model\_Polygon.shp

Model\_Polygon.shp.xml

Model\_Polygon.shx

Streamline\_La\_Crosse\_River.dbf

Streamline\_La\_Crosse\_River.prj

Streamline\_La\_Crosse\_River.sbn

Streamline\_La\_Crosse\_River.sbx

Streamline\_La\_Crosse\_River.shp

Streamline\_La\_Crosse\_River.shp.xml

Streamline\_La\_Crosse\_River.shx

XSCutlines.dbf

XSCutlines.prj

XSCutlines.sbn

XSCutlines.sbx

XSCutlines.shp

XSCutlines.shp.xml

XSCutlines.shx

1mdem\_rchr

hillshade

Hydraulics

info

1mDEM\_rchR.aux.xml

1mDEM\_rchR.ovr

flt\_1mdem\_rchr.flt

flt\_1mdem\_rchr.hdr

flt\_1mDEM\_rchR.prj

La\_Crosse\_River.mdb

La\_Crosse\_River.mxd

La\_Crosse\_River\_orig.mxd

log

Model\_Polygon.dbf

Model\_Polygon.prj

Model\_Polygon.sbn

Model\_Polygon.sbx

Model\_Polygon.shp

Model\_Polygon.shp.xml

Model\_Polygon.shx

Q\_Pts.dbf

Q\_Pts.prj

Q\_Pts.sbn

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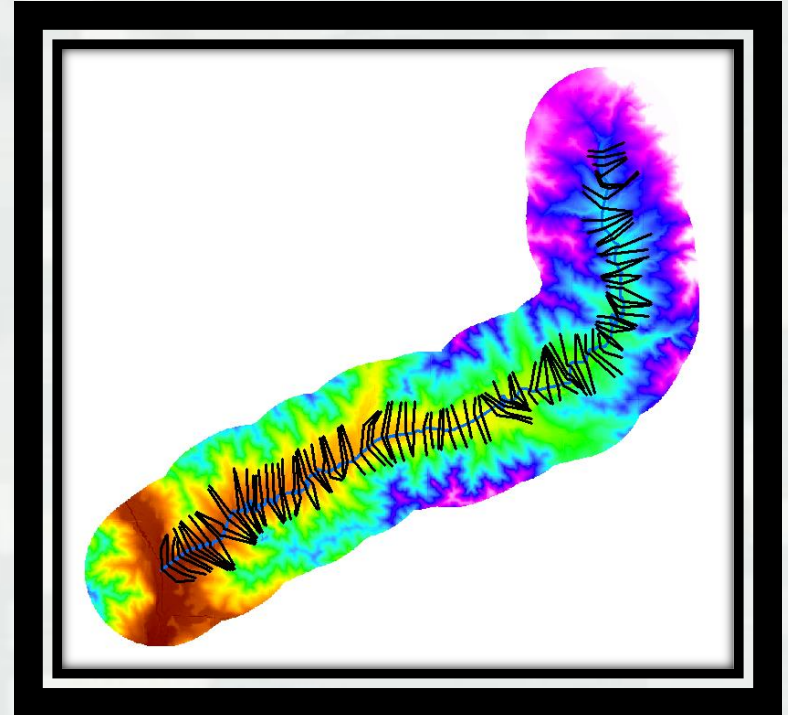
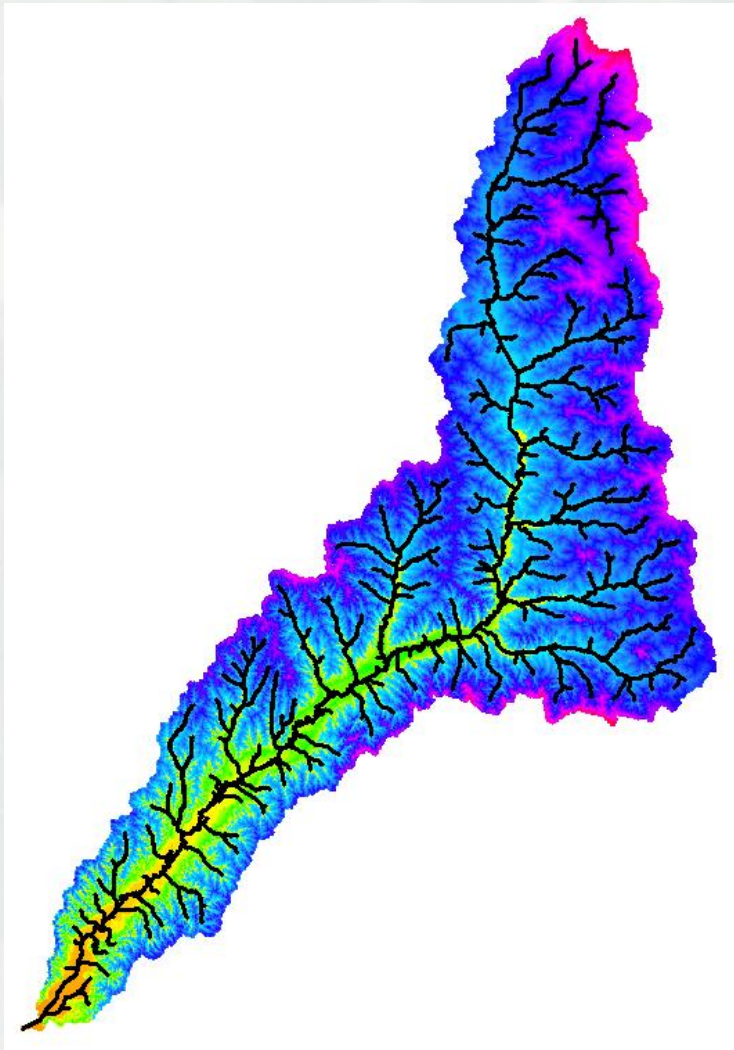
XSCutlines.shx



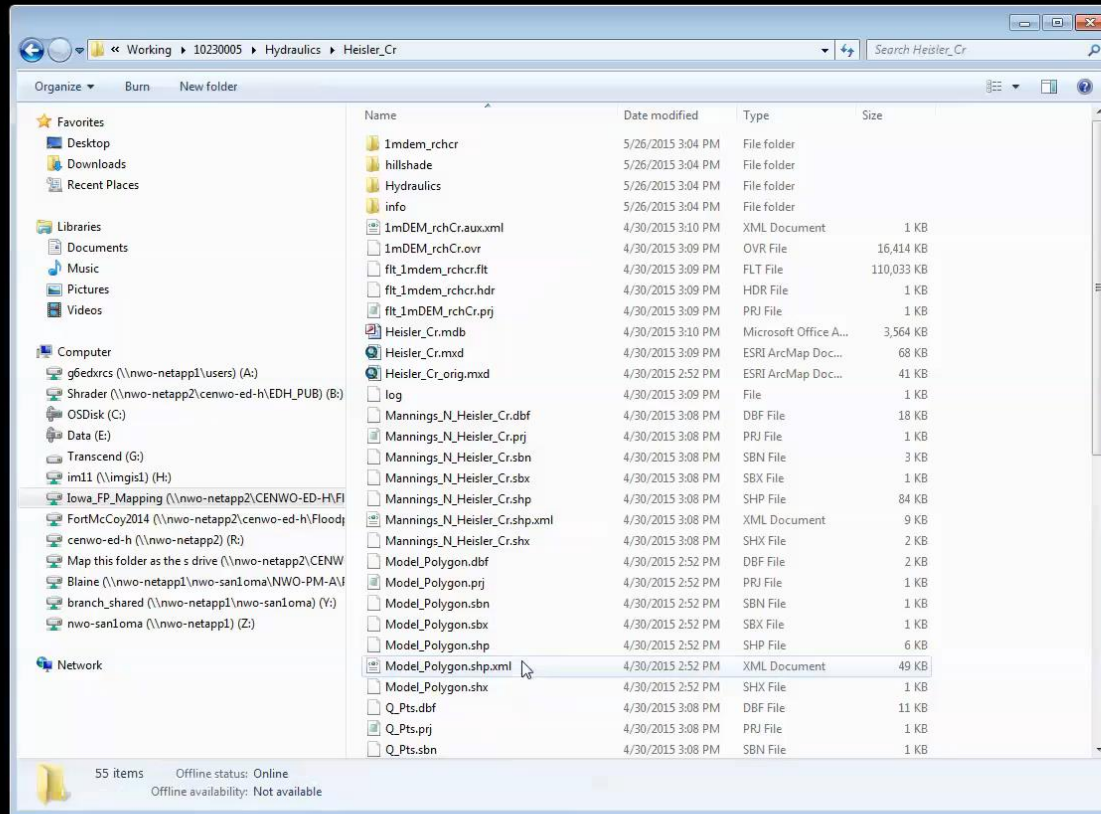
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# Individual Stream



# Heisler Creek Example Video



# Arc2RAS

- Creates the HEC-RAS flow file
  - ▶ Imports flow values from the discharge point locations in GIS
- Creates a backup text file for comparison during the QAQC tool check





# QA/QC

No easily definable criteria for Zone A mapping, additional customer identified criteria applied

USACE – Omaha District QA/QC automated tool checks:

- Completeness Review:

- Is the project title correct?
- Is there only one plan, geometry and flow file?
- Are the plan, geometry, flow titles correct?

- Geometry Review:

- Model units
- Are the reach lengths correct?
- Is the cross section stationing in line with the reach lengths?
- Are the cross sections long enough to include the flooded areas?
- Are the overbank Manning's values correct?
- Are the channel Manning's values correct?

- Flow Review:

- Does the model contain each profile
- Are the discharges for each profile correct?
- Do the flows increase in the downstream direction?
- Is the slope acceptable for boundary conditions-normal depth?

- Results Review:

- Do any of the profiles cross or contain dips?



# Hydraulics Completion

- USACE Omaha District Completed Modeling for 8 HUC8 Watersheds
  - 2,000 individual streams
  - Calibrations using USGS measured field data
  - Re-Delineations on detailed study (FEMA Mapped Zone AE) areas



# Project Stages

- Hydrology and Hydraulics Done
- Re-Delineations Incorporated (if any)
- New Studies Incorporated (if any)
- FPM Manual Cleanup/Review

Stage One:  
Initial Mapping Complete

- Phone Kick-off Meeting with officials/stakeholders
- DFHP Meeting with officials/stakeholders
- Distribute Products (Shapefiles, Depth Grids, Models, CSLF) to stakeholders
- Deliver data on [www.lowfloodmaps.org](http://www.lowfloodmaps.org) website
- Elicit Feedback from officials/stakeholders

Stage Two:  
Draft FPM Products Delivered  
(Public Official Ready)

- Incorporate new development since LiDAR
- Incorporate new information from community
- Review to assess impact of new information
- Follow up with officials regarding results
- Incorporate changes into FPM/Hydraulic Submittals if warranted
- Incorporate changes into other products (Depth Grids, CSLF)

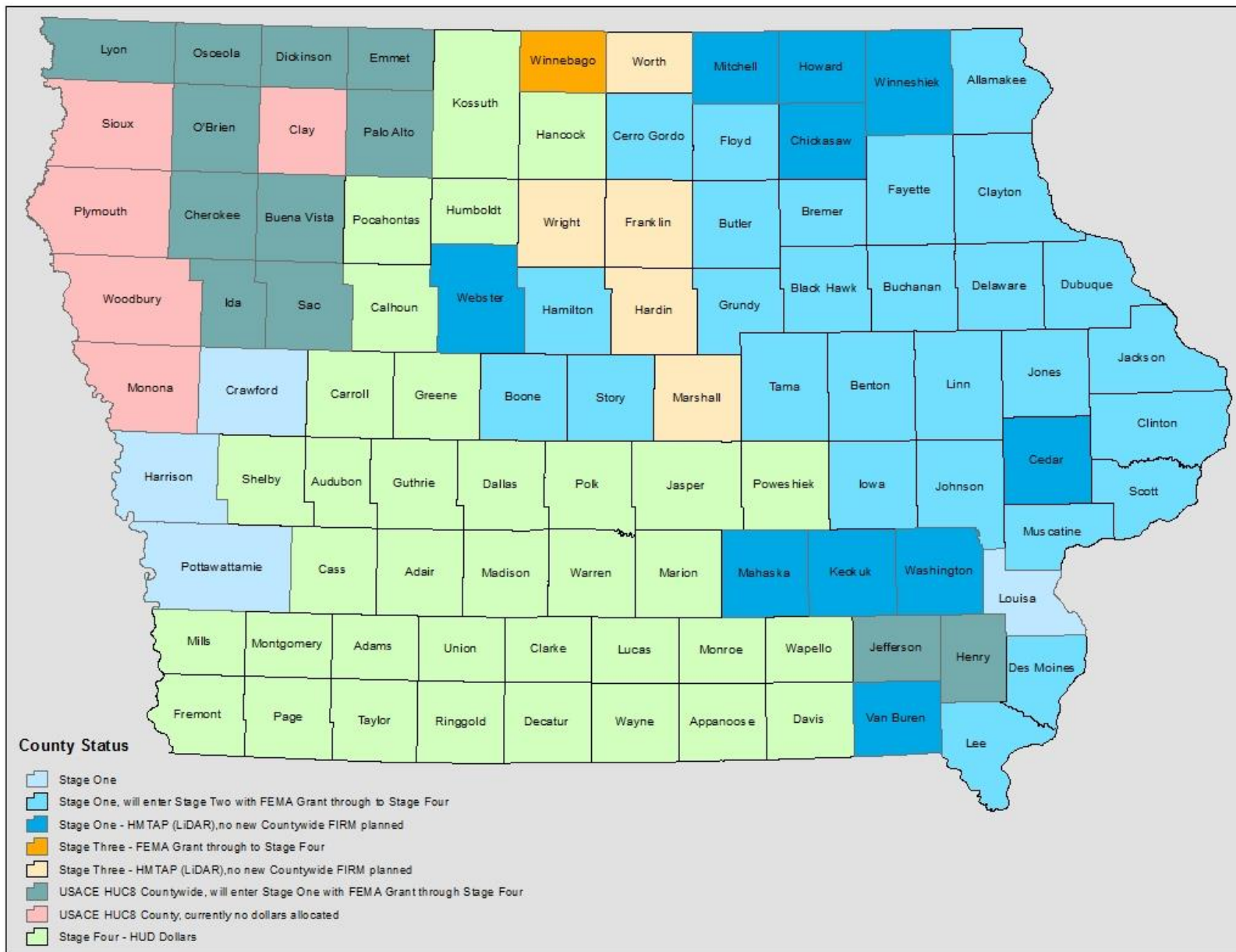
Stage Three:  
Incorporate Changes to FPM  
Products  
(Public Ready After Complete)

- Base Map preparation (roads, panels, general structures, sub-basins) – **IFC GIS Staff**
- Preliminary Map Preparation before preliminary submittal to FEMA – **DNR Subcontractor**
- Incorporate last minute changes
- Post Preliminary Map Production – **DNR Sub**
- Meetings (Engineering Review/CCO) – **DNR/FEMA/Sub**
- Letter of Final Determination – **DNR/FEMA/Sub**
- COMPLETE!!!

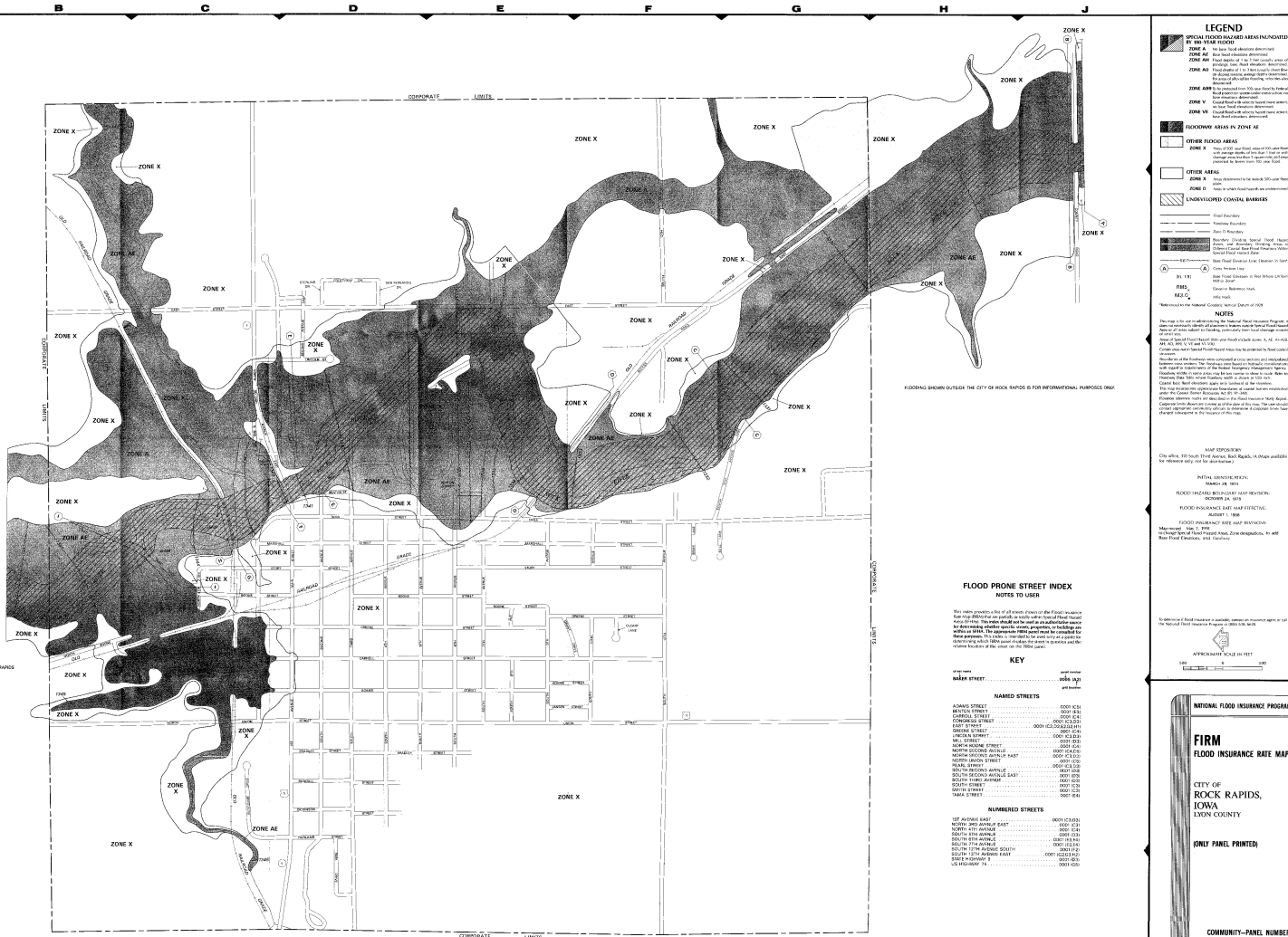
Stage Four:  
DFIRM







# Rock Rapids, Iowa



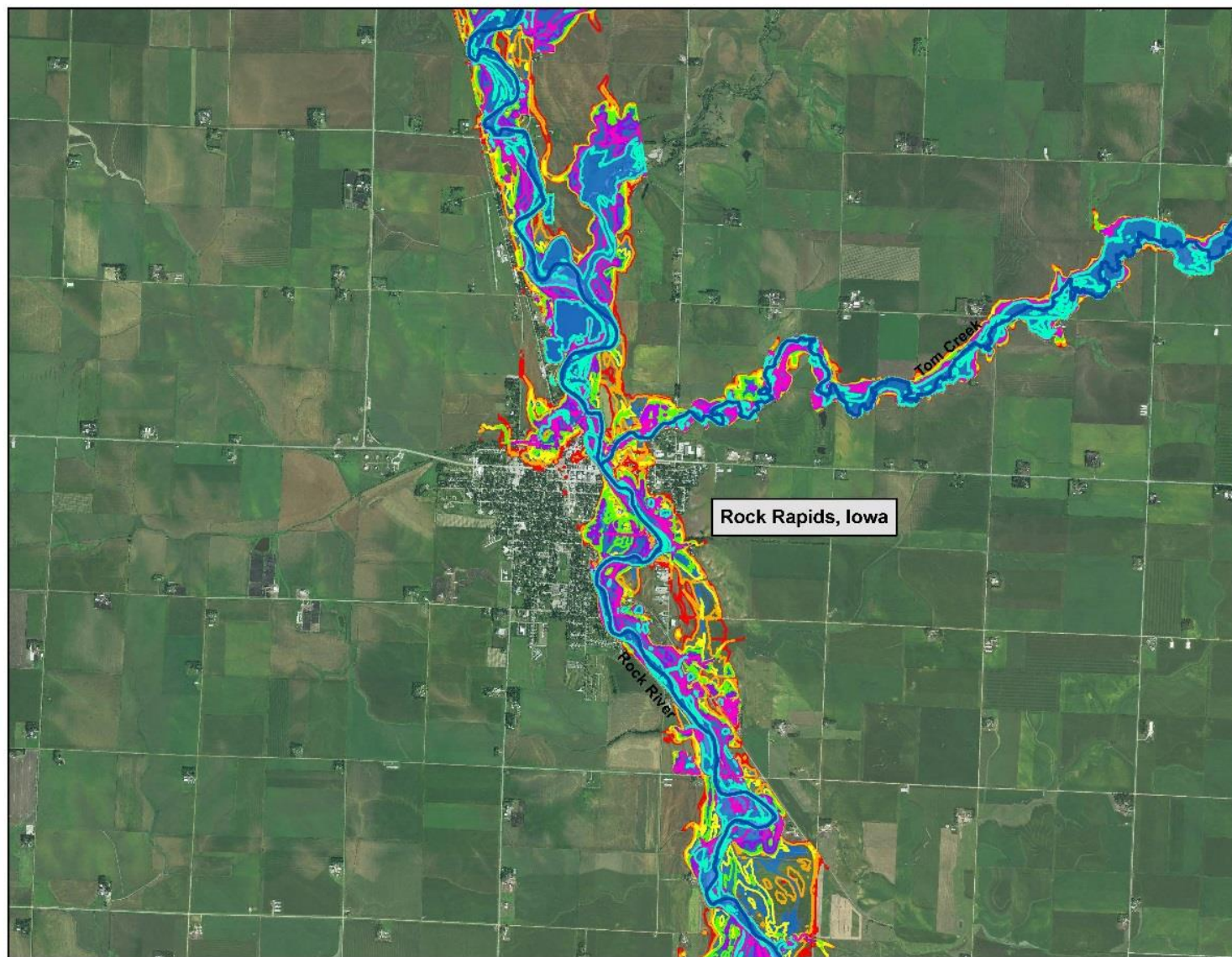


# Non-Regulatory Floodplain Boundaries



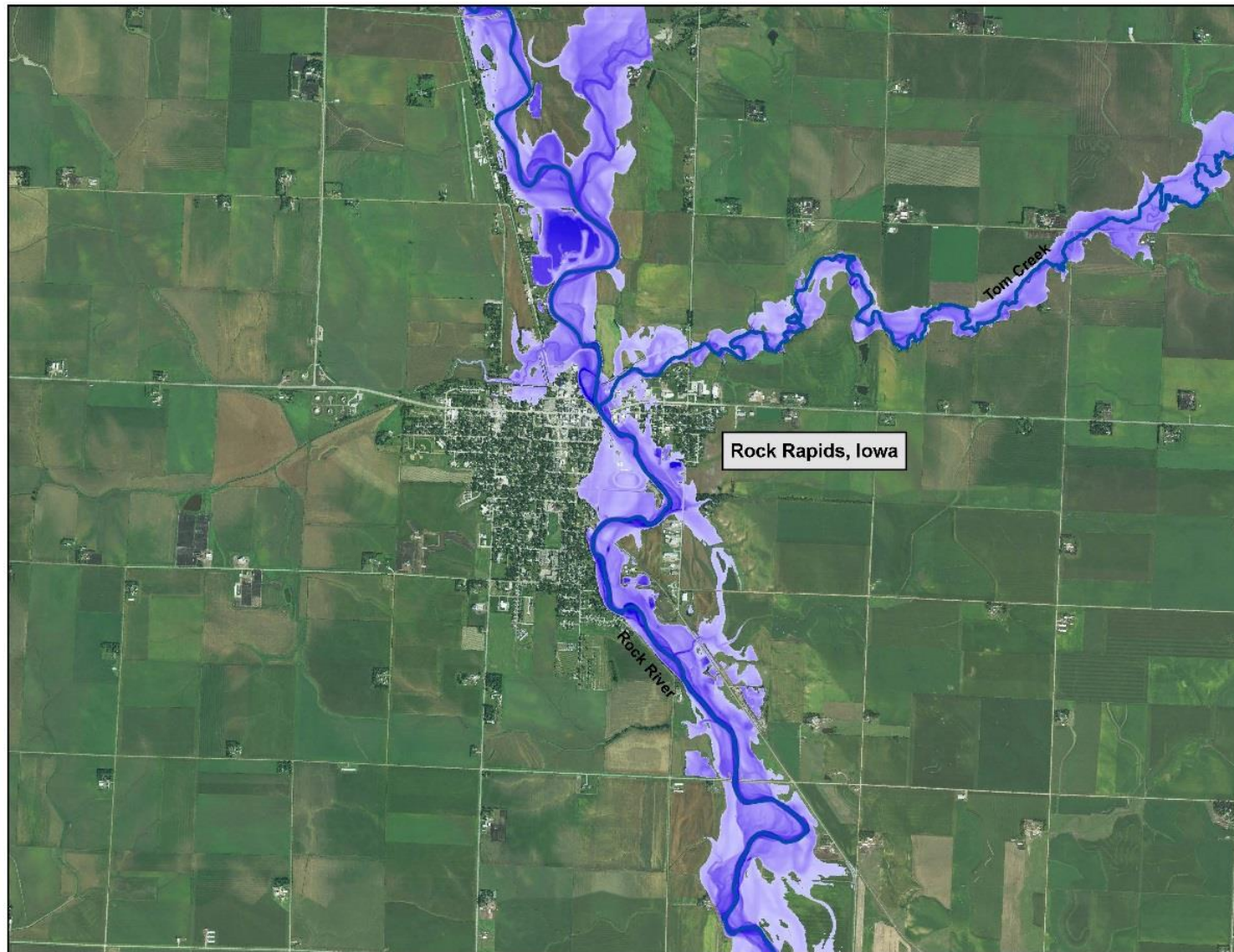


# Non-Regulatory Floodplain Boundaries

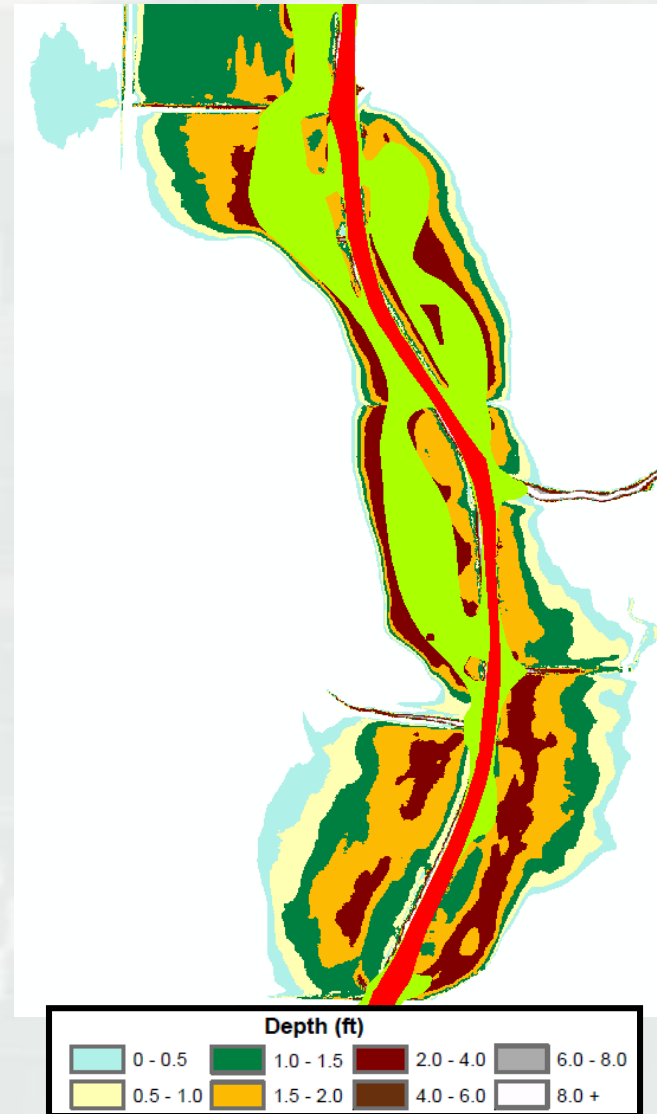
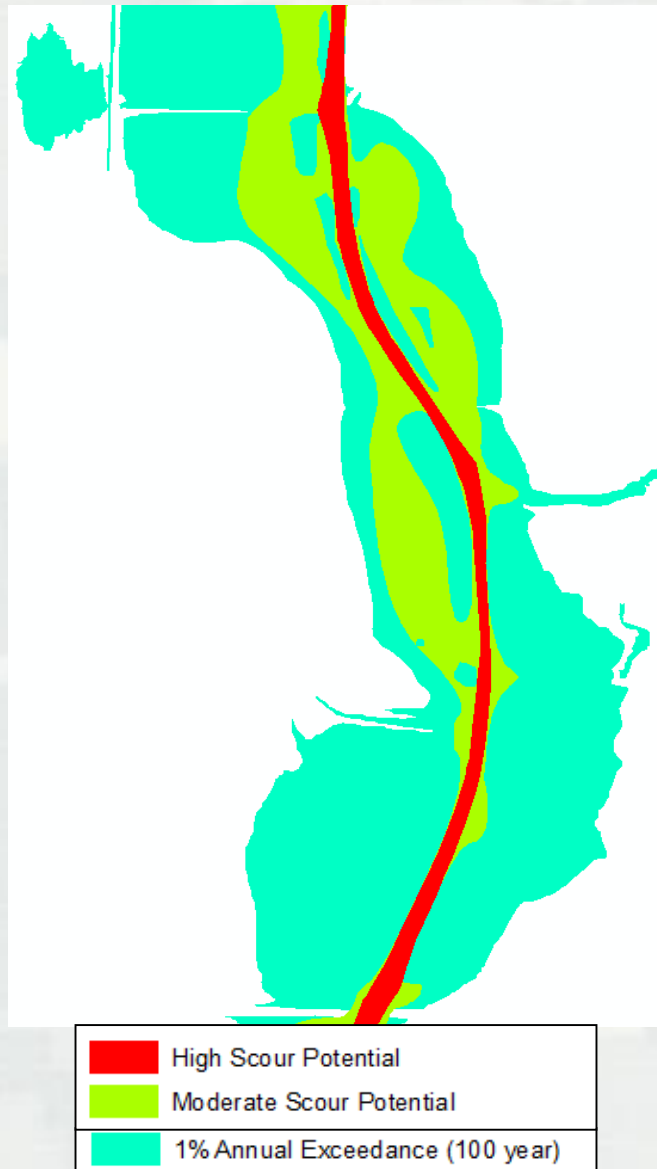




# Depth Grids – A Deeper Look at Inundation



# Scour Targeting Maps





# Continued Mapping Efforts: Post Project

- Some communities currently mapped in detailed study areas (Zone AE) are not being updated through this study
  - ▶ Re-delineation models created
  - ▶ Current Zone A models and terrain available to update the existing mapped Zone AE Detailed Study areas
    - Need structure survey data
    - Sources available to upgrade current Zone A mapping to Zone AE mapping for communities in need of a detailed study flood zone



# What Did We Accomplish?

- Successfully updated the existing flood risks within the state of Iowa
  - ▶ People have the resources to be aware of their risks
  - ▶ More residents located in the 100-year floodplain boundary
    - Newly mapped residents inside the boundary will have to purchase flood insurance per NFIP requirements
    - Is this a good thing?
- How can we help these communities after providing them this information?



# Questions?

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Special Thanks:

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